BAE SYSTEMS

New Hampshire Manufacturing Extension Partnership

BAE Systems puts Energy into their Lean Implementation

Client Profile:
BAE Systems is a global defense, security and aerospace company which provides products and services to all branches of the military. The company employs 499 people at its facility in Nashua, New Hampshire.

Situation:
The U.S. Environmental Protection Agency (EPA) in collaboration with the New Hampshire Manufacturing Extension Partnership, the Massachusetts Manufacturing Extension Partnership (MassMEP), and the Maine Manufacturing Extension Partnership (Maine MEP), NIST MEP network affiliates, developed a pilot program using tools and techniques to allow the integration of Lean Manufacturing and Energy Management. Six manufacturers with high energy usage, (two per state) were chosen to participate. By using The Lean and Energy Toolkit, produced by the EPA and their partners, processes involving energy consumption or environmental concerns are identified and addressed along with the improvements made during traditional Lean manufacturing projects. The goal is to achieve process excellence using less energy. As a large consumer of energy in New Hampshire, BAE Systems was invited to participate in the Lean and Environmental pilot. The initial Lean and Energy assessment took place at BAE Environmental Test Services (ETS) in Merrimack, New Hampshire.
A team of seven key BAE employees, a professional energy consultant, Paul Lockwood from the NHMEP Department of Environmental Services, David Hess a NHMEP Project Manager, and the facilitator Charles Lincicum from Mass MEP, began their work by creating a problem statement that outlined their mission. Roughly, it stated that the ETS uses energy intensive equipment which operates continuously due to the demand and requirements of the customers and results in significant energy consumption. Stephen Beaureguard, a team member and employee from BAE's Continuous Improvement Group said, "BAE had already been implementing the Lean tools and philosophy. Historically energy and the environment did not enter in to the standard Toyota Method of Lean work so it is an interesting paradigm. NH MEP brought in a tool kit that allowed us to use the value streams we had already been working with in our own Lean implementation and revisit them to identify energy and environmental concerns."

Solution:
The team revisited BAE's Value Stream Maps and created new ones utilizing the SIPOC (Supplier- Input- Process- Output- Customer) methodology to identify what energy, material and consumables went into each process and in what form it left. This helped the team determine which 'on the floor' investigations would be performed. They worked throughout the building addressing the most significant problems. Employees from BAE's Facilities Department were instrumental in these Lean and Energy 'hunts' which look for things like air leaks, machines being left on, emissions and other energy related issues. Unlike conventional energy audits, the Lean Energy and Environment program

identifies inefficiencies in manufacturing processes that can be improved to reduce, re-use or eliminate the need for energy.
The group found that operators had no standard maintenance procedures for equipment shutdown which resulted in energy waste. There were lighting variations and misuse (being left on), a 400Hz generator and vacuum pumps were running while empty, the air supply pressure was too high throughout the facility and some air sources remained on after shut down. Test chambers were larger than necessary, an outdated and oversized compressor ran around the clock, a drier was being over used, and the efficiency of the some test apparatus was questionable. Identified Energy related wastes included: lighting, compressed air (leaks, excessive pressure, running unnecessarily), appliances, computer and monitors left on, hardware and HVAC. Environmental wastes included: exhaust air, water, nitrogen, heat, boiler exhaust and packaging. Energy loss, environmental impacts and their related costs were then calculated based upon these findings.
From here a Kaizen plan was written and procedures were implemented. These included adding energy conservation considerations to the operator maintenance checklist for equipment shut down. Compressed air leaks, heat loss and pump efficiency were checked and addressed. Proper equipment use procedures were verified and standardized. The team gathered data and looked into disposal costs for waste water. Andon lights were installed as visual indications of equipment operation. Larger than necessary equipment was right-sized and a remote stop and start station was added to the 400Hz generator after the horsepower was reduced. Solenoids were installed to achieve air savings. Lighting savings came from re-bulbing and installing automatic shut offs. Compressed air usage was reduced to the lowest acceptable level for operation. Ongoing efforts between facilities and operations personnel were coordinated to identify and track energy consumption. A sustainment plan was designed and implemented at the close of the project which included weekly and monthly audits, energy usage tracking procedures and a standard Total Productive Maintenance plan.

Results:
* Realized $45,604 in energy savings.

Testimonial:
"Through the Lean and Energy training we were able to see a great new opportunity for additional cost reduction which allows us to be more competitive. This exercise has helped create a team atmosphere between departments that we hadn't had before. It helped break down barriers and improved communications and information sharing. Now we can run equipment more efficiently by considering the cost of energy involved."

Stephen Beauregard, BAE Continuous Improvement Group